Working Paper F.6

Background Data Available for GARM3 Analyses of growth and Maturity

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This Working paper will address TORs 1 and 2 of section: F. Ecosystem Data for use in stock assessments. It will provide time-series data for correlation studies and may also help in addressing causality for changes in growth and maturity.

TORS
1. Describe methods for detecting trends in average size, maturity and weight at length.
2. Identify primary time series of extant environmental data and describe methods used to derive estimates on appropriate spatial and temporal scales.

Background & Context

The Northeast Fisheries Science Center (NEFSC) of the National Marine Fisheries Service (NMFS) has had the Food Web Dynamics Program (FWDP) in form or another since 1953. The FWDP is responsible for designing the collection of, sampling, processing samples, quality control and data auditing, database management, and analyzing food habits data for the major fish species in the northwest Atlantic. There have been changes in protocols over the extent of the program, but effectively the core of what is collected has remained generally consistent for multiple decades. For further details of the history, sampling protocol, and philosophies of the FWDP food habits database, see Link and Almeida (2000).

The stomachs are collected and mostly processed at-sea as part of the NEFSC bottom trawl survey. Select subsamples of stomachs are brought back to the lab for processing and quality control purposes. The bottom trawl survey executes tows in a stratified random design, with the number of tows per strata dependent upon strata area. Although we track the number of stomachs, strictly speaking in a statistical sense, our sampling unit is an individual tow. For further details of the NEFSC bottom trawl survey, see Grosslein (1969), Azarovitz 1981, NEFC (1988) and Reid et al. (1999).

These data serve as the basis for a plethora of multi-species, single-species add-ons, and ecosystem models. Having a solid foundation of food habits data such as that maintained by the FWDP places the NEFSC in a good position to begin implementing ecosystem approaches to fisheries.

Metadata

The food habits database (FHDBS) contains more than 500,000 stomachs from over 130 predators and has more than 1,300 different prey items. For most fish species, diet can be adequately characterized with the examination of 500 – 1000 stomachs, which is the case for the 40-50 main species. The data have been collected quantitatively since 1973 to present (at the time of this report, 2007). The data have been routinely collected in the two principal seasons of the bottom trawl survey, both during spring and during autumn. Additional stomachs have been collected in other seasons (namely winter), on

other surveys (e.g., some scallop survey goosefish stomachs), and on process-oriented cruises.

Common Metrics & Output

There are a plethora of statistics and metrics that can be presented (e.g., Hyslop 1980, Cortes 1997) to describe, model and analyze fish food habits data and trophic ecology. For a broad range of examples for a suite of northwest Atlantic species there are copius examples (e.g., Brodziak and Link in press, Garrison and Link 2000a, b, c; Link and Almeida 2000, Link and Garrison 2002a, b; Link et al. 2002a, b, 2006, Overholtz and Link 2007).

Generally speaking, we often present appropriately weighted (statistically speaking taking into account survey design and various size, seasonal, yearly, or geographic factors) estimates of mean stomach contents (g), percent diet composition of major or specified (i.e., prey species of interest) prey, percent frequency of occurrence of major or specified prey, number of stomachs, number of tows with stomach collected, number or percent of empty stomachs, percent daily ration (stomach content / body mass), and various derived estimates of consumption rates (both on an individual and population basis).

For the purposes of the GARM, we will provide a set of food habits time series for the GARM species in appropriate strata sets, seasons, and size groupings. Variables will be total stomach contents daily rations (from 1991 forward) and percent of empty stomachs. If time permits, we may provide percent diet composition of major prey and per capita consumption rates of these predators.

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